NAUTICAL CHART ACTIVITIES IN THE U.S. ARMY CORPS OF ENGINEERS

NOAA Open House on Nautical Cartography

27 July 2018

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Washington, DC

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USACE NAVIGATION MISSION

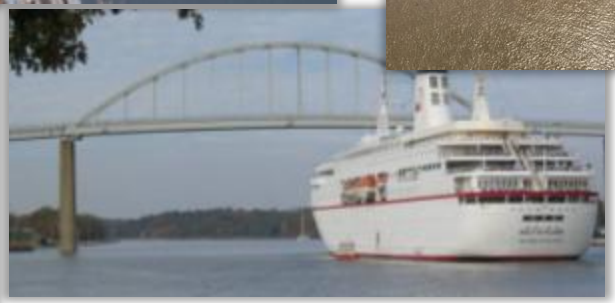
Provide safe, reliable, efficient, effective and environmentally sustainable waterborne transportation systems for movement of commerce, national security needs, and recreation.

COASTAL NAVIGATION ASSETS

19 lock chambers
13,000 miles of channels
929 navigation structures
844 bridges

INLAND NAVIGATION ASSETS

27 Inland River Systems
207 lock chambers @ 171 lock sites
12,000 miles of inland river channels



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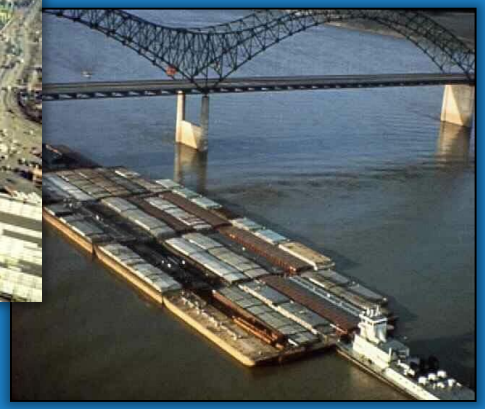
EXTENSIVE WATERWAY MAINTENANCE AND CONSTRUCTION ACTIVITIES

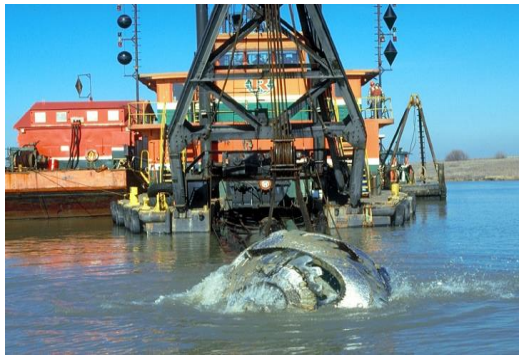
***** *Resulting in timely and accurate chart data* ****

Authorized Navigation Channel Projects

- High Use: > 10M tons 56
- Moderate Use: 1M to 10M tons 74
- Low Use: < 1M tons 938

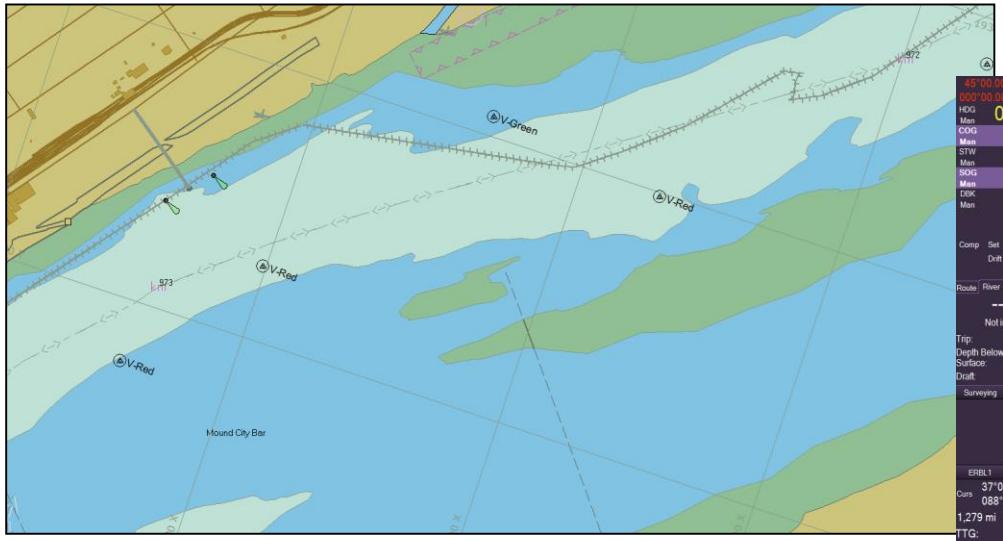


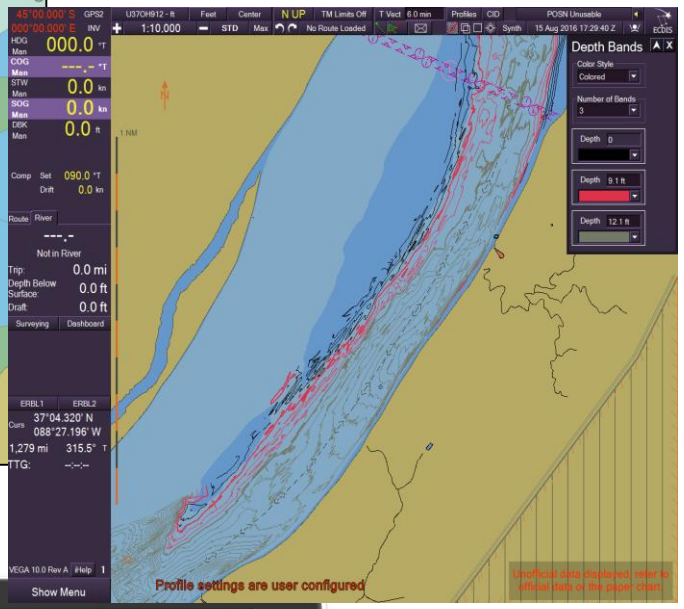
Channel dredging averages 280M cubic yards per year

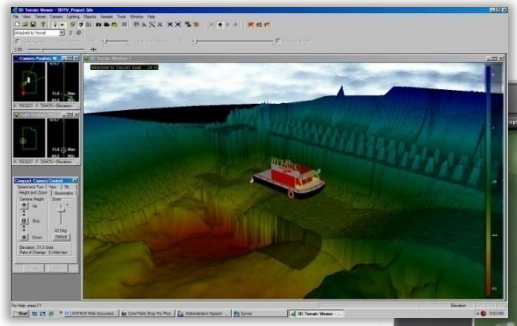


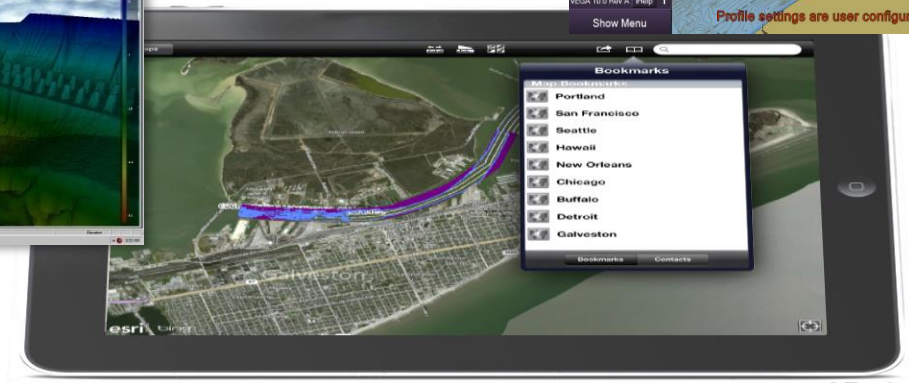
55 Inhouse Hydrographic Survey Vessels

INLAND ELECTRONIC NAVIGATIONAL CHARTS (IENCS)









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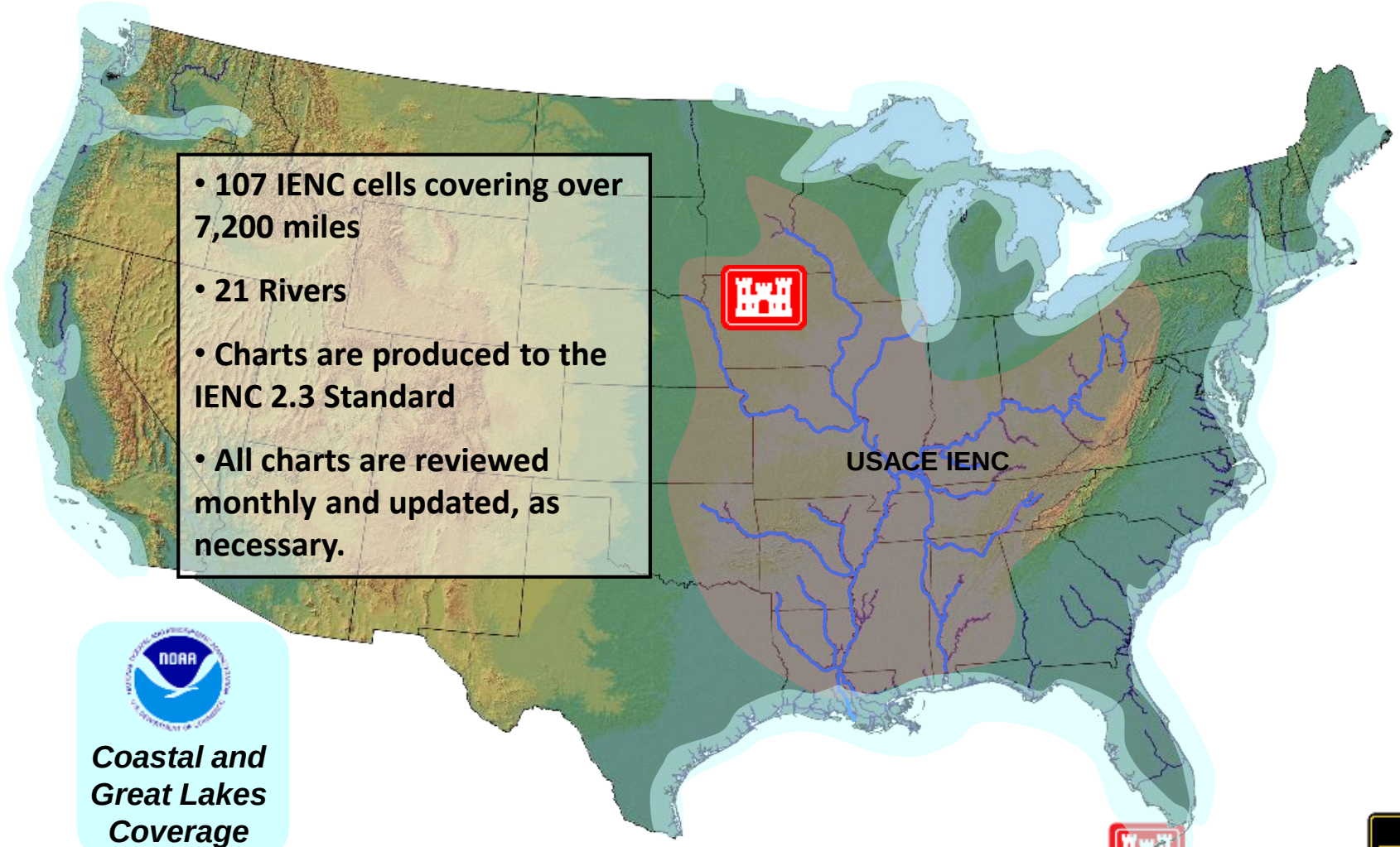
INLAND ENC COVERAGE IN USA



15 USACE Districts & US Army Geospatial Center

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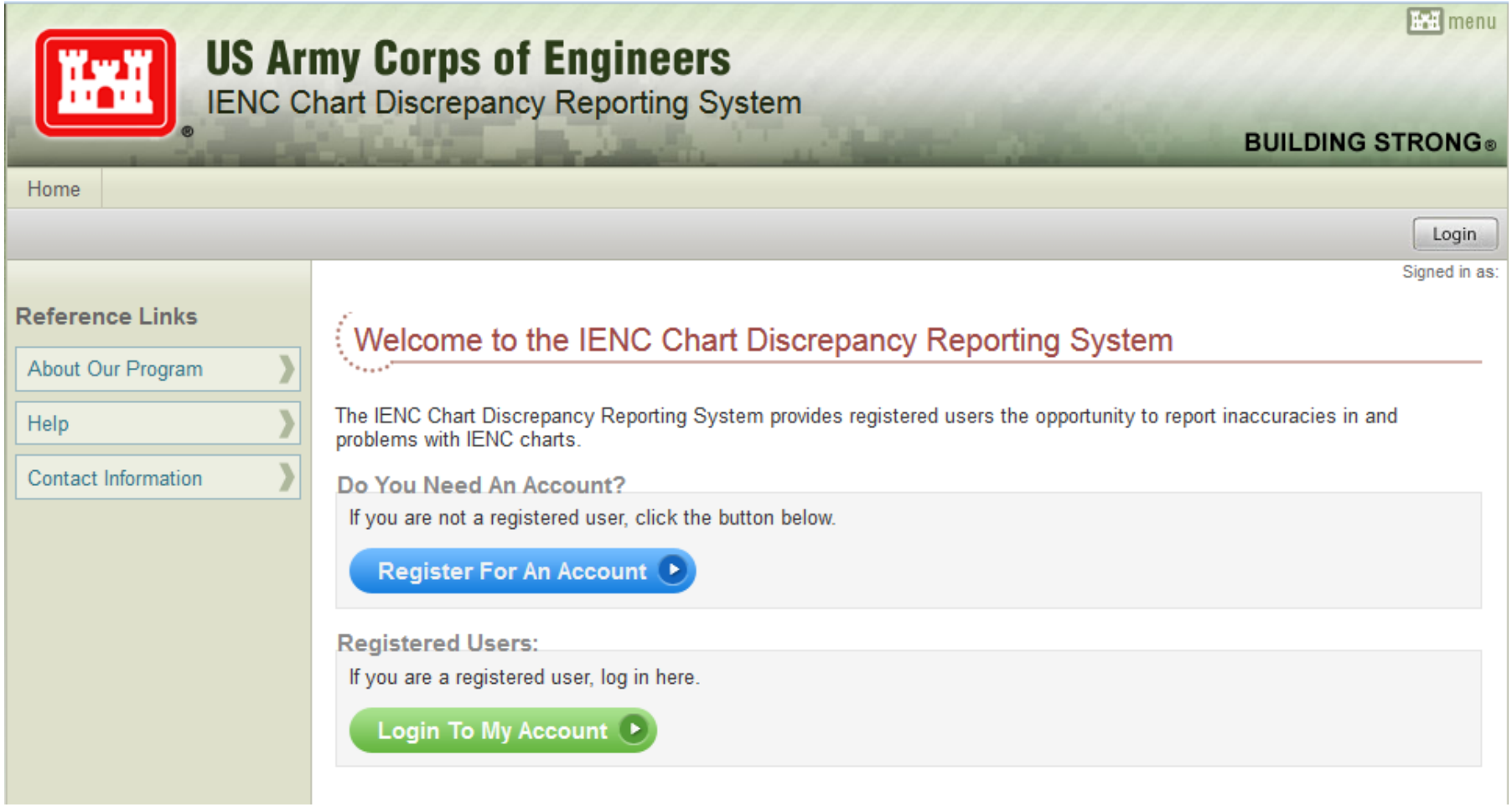
CHART DISCREPANCY REPORTING SYSTEM

https://ienc-report.usace.army.mil/



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IENC CLOUD BACKGROUND

- Federal Geographic Data Committee (FGDC) issued an RFP in Dec, 2011 to sponsor pilot project with 10 Federal agencies to distribute their public data free for one year on Amazon Web Services (cloud), ending March, 2013. Named the Geocloud Program.

- IENC was chosen because of relatively small dataset and expertise with ArcGIS. Approval was given by CIO, USACE to distribute public navigation data on AWS

- https://www.ienccloud.us

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IENC CLOUD BACKGROUND

- Advantages include
  - very high reliability of server performance
  - cost effective data hosting
  - scalable CPU availability
  - remote access for data updates

- ArcGIS Server 10.1
  - Over 6000 GIS layers uploaded
  - Clients
    - ArcMap, ArcGIS Explorer
    - ArcGIS JavaScript
    - Google Earth
    - ArcGIS.com

- Experienced over 9 million downloads

IENC Cloud

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INTERNATIONAL IENC STANDARDS AND DEVELOPMENT

- Non-Governmental International Organization recognized by IHO
- Organized to develop and to maintain a standard for IENCs world-wide
- Standard based on the existing standards of International Hydrographic Organization for ‘maritime’ ENCs (S-57)
- Currently working to align the S-401 IENC standard with the maritime S-101 standard

Inland ENC Harmonization Group

Members

Austria	Belgium
Brazil	Bulgaria
China	Czech Rep
France	Germany
Hungary	Italy
Netherlands	Peru
Poland	Romania
Russia	Serbia
South Korea	United States
Venezuela	

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WHY AN “INLAND” STANDARD?

Examples of unique features found in waterways which are not found in maritime waters

- Casino / Gaming Boats

- Fleeting Areas

- Ice Breakers
- Lock Guide Walls
- Exceptional Navigation Structures (Lift bridges/viaducts)

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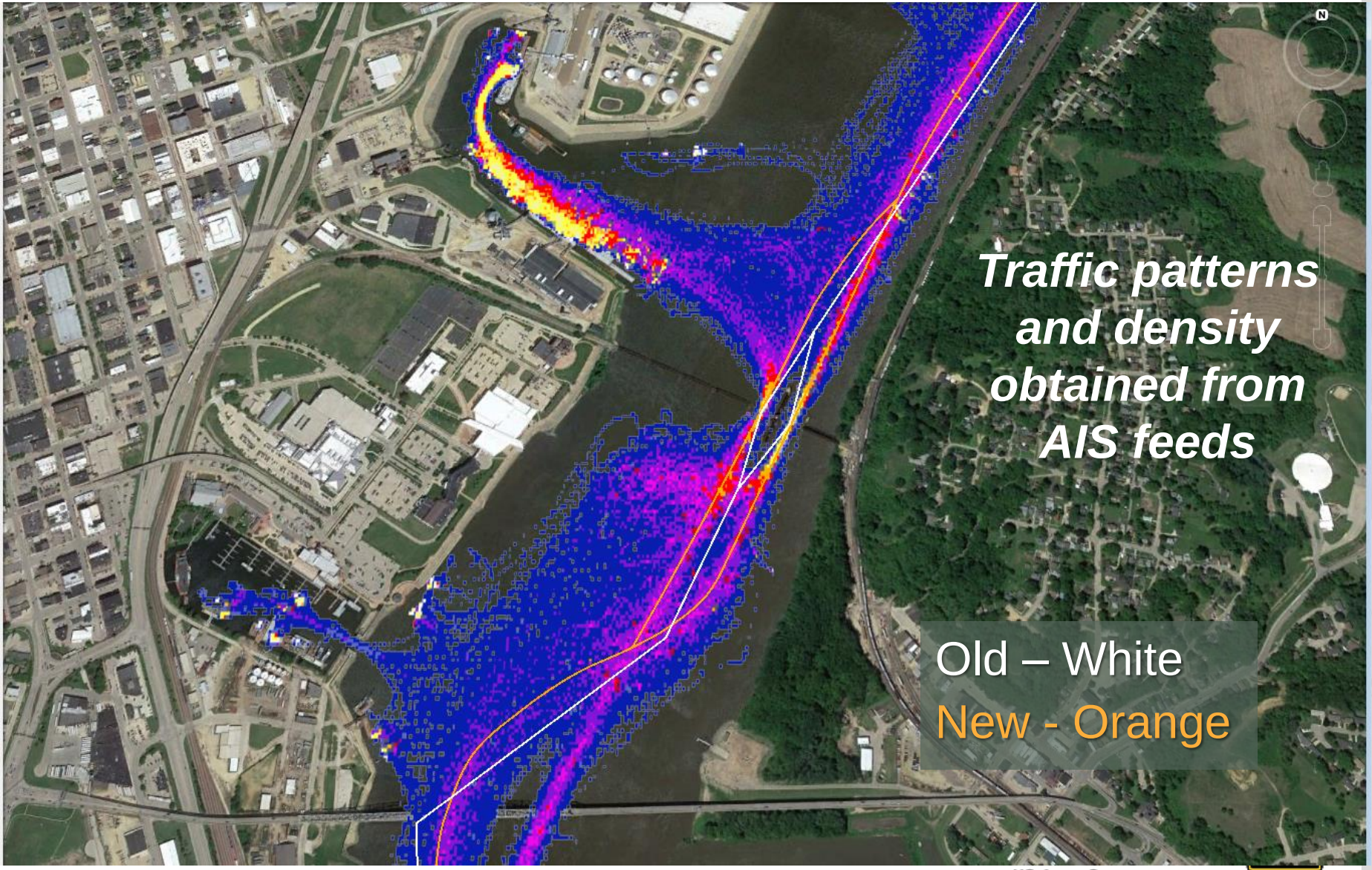
CROWD-SOURCED FEATURE: SAILING LINE



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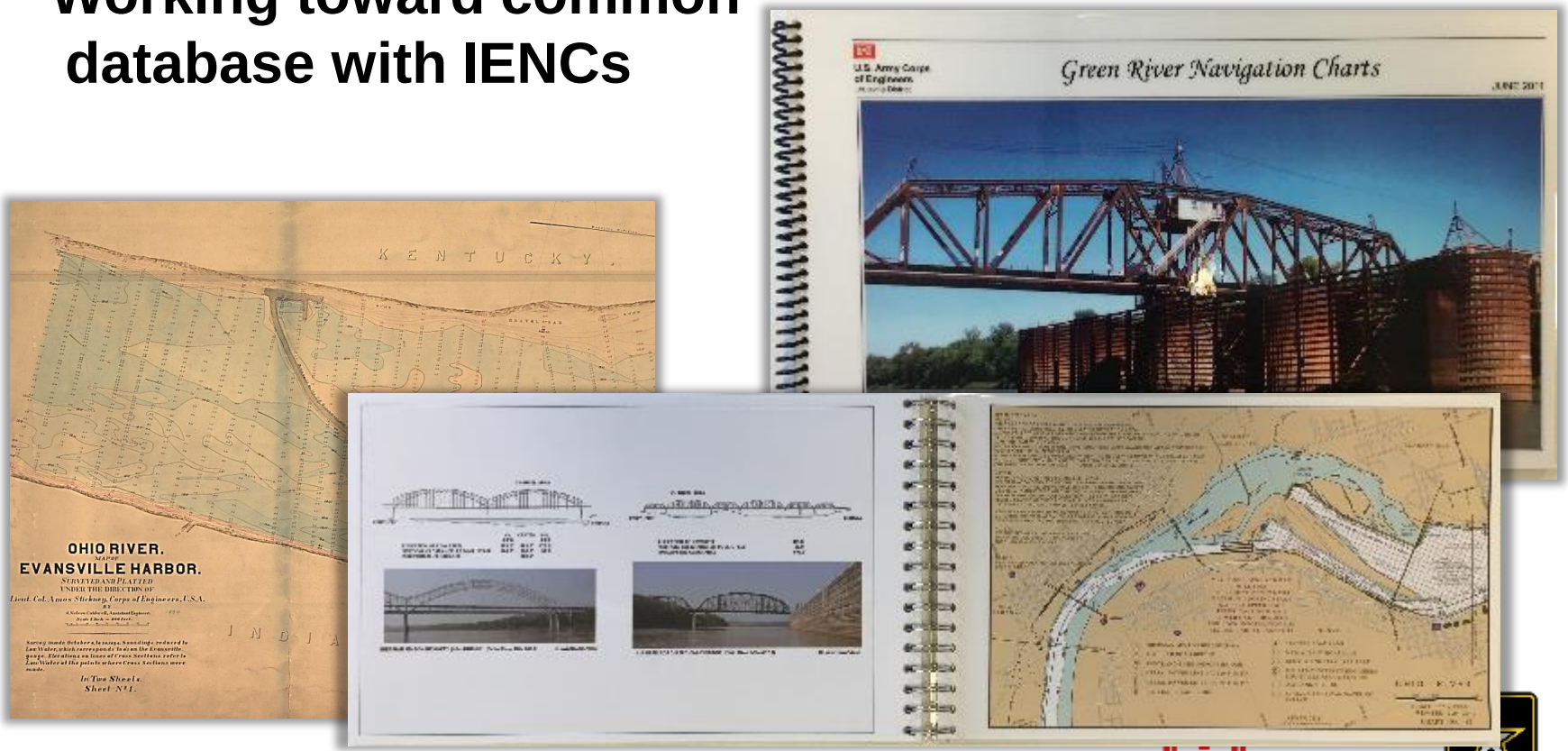
INLAND CHART BOOKS – *STILL PRODUCED AND AVAILABLE*

- **Compiled from Computer-Aided Design and Drafting files**
- **Working toward common database with IENCs**



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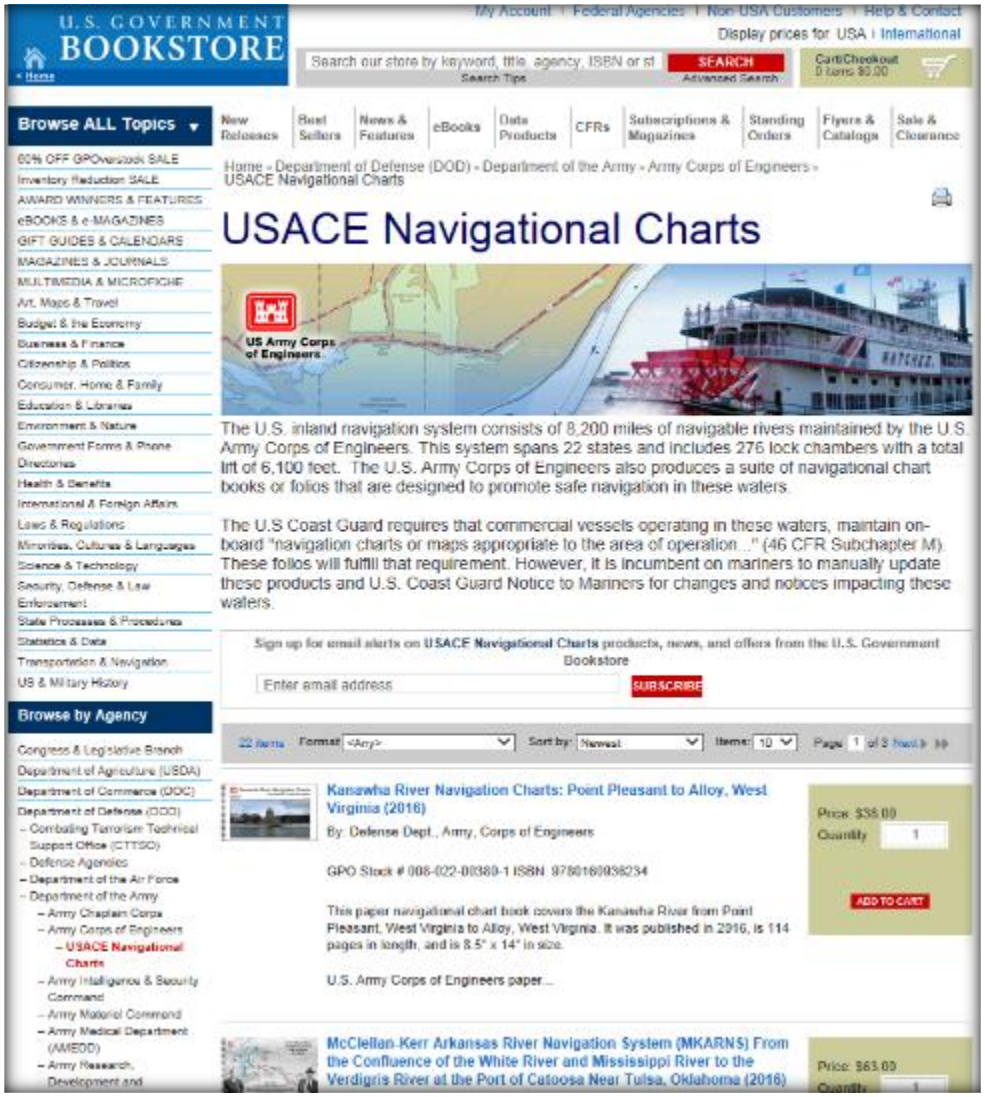
“PRINT ON DEMAND” PAPER CHARTS GOVERNMENT PUBLISHING OFFICE (GPO)



A One-Stop-Shop for all USACE Paper Chart Books

- 20/22 Chart Books Available
  - 1 to be released in 2017
  - 1 to be released in 2018

Current production guidance

– EP 1130-2-520 NAVIGATION AND DREDGING OPERATIONS AND MAINTENANCE GUIDANCE AND PROCEDURES

https://bookstore.gpo.gov/agency/1784

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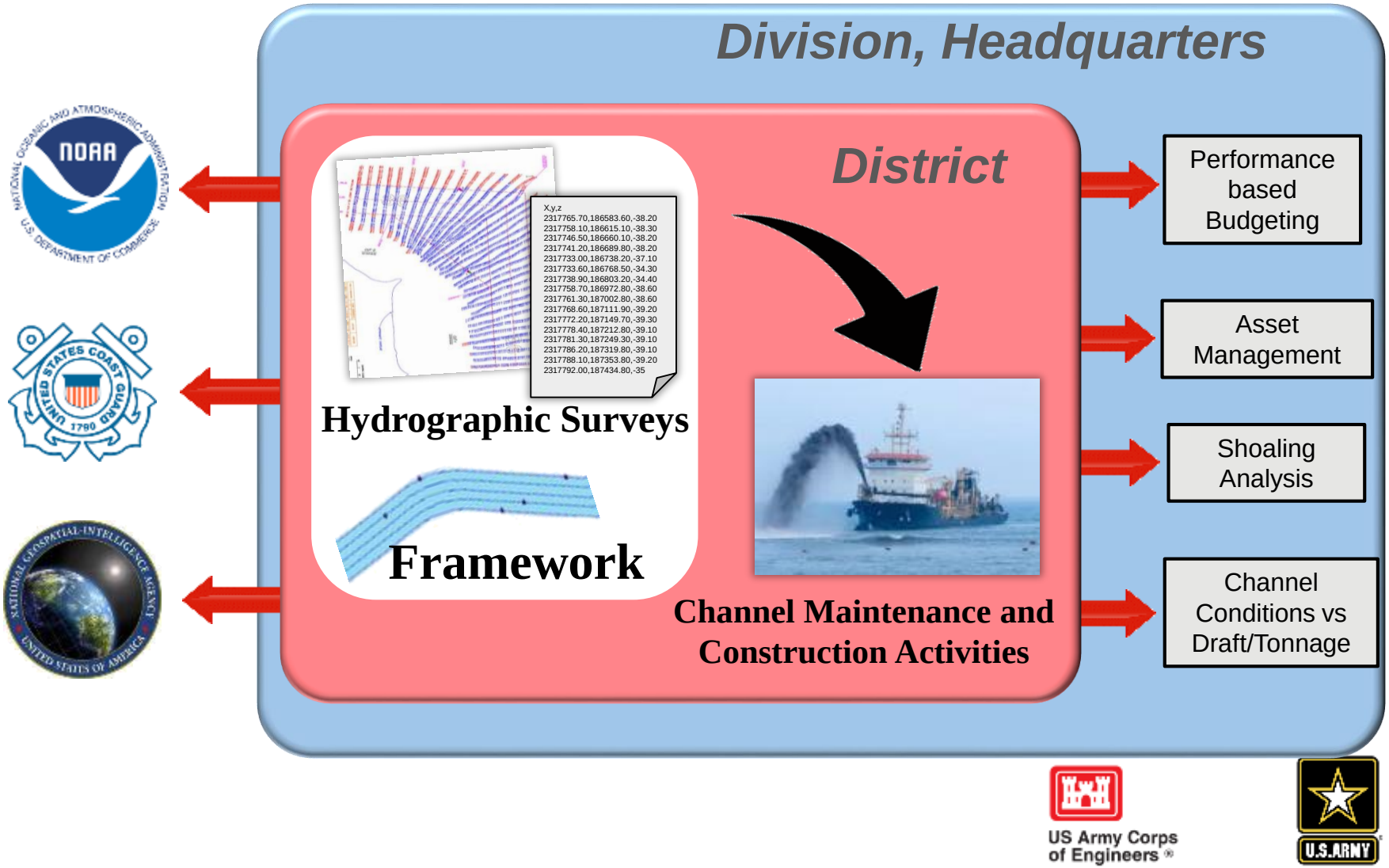
Navigation Channel Data Needs



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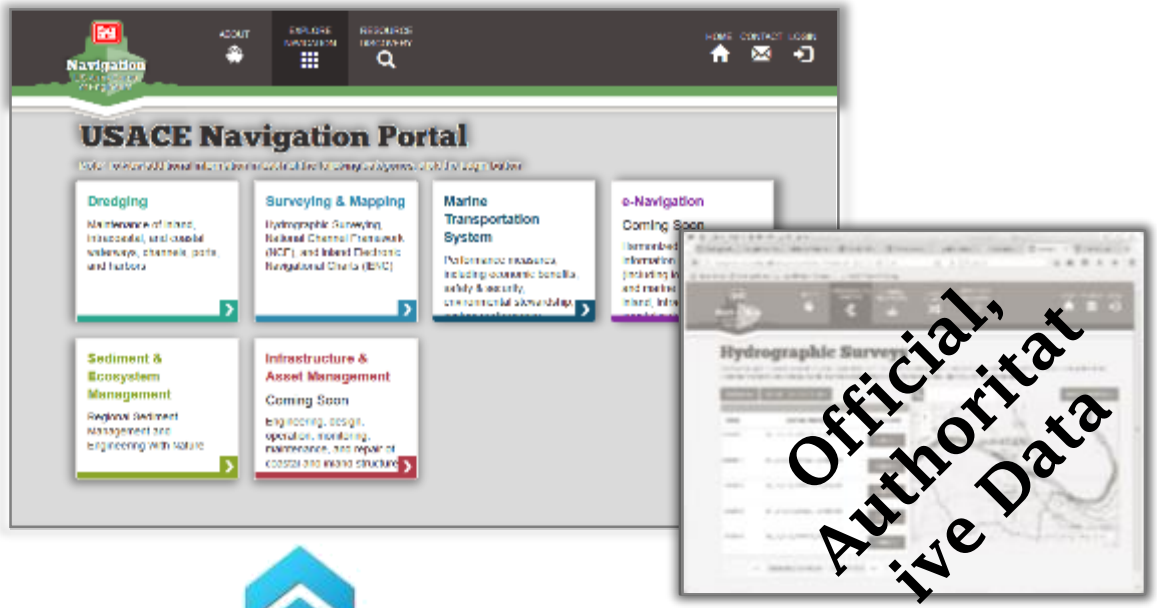
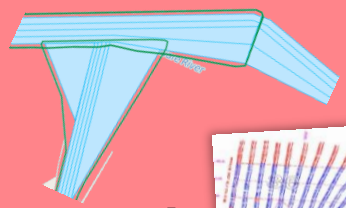
eHydro Application and Reporting Process



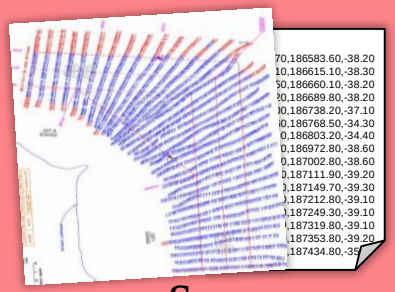
District

eHydro Application

esri



Framework



Surveys

Channel Maintenance and Construction Activities

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eHydro Outputs

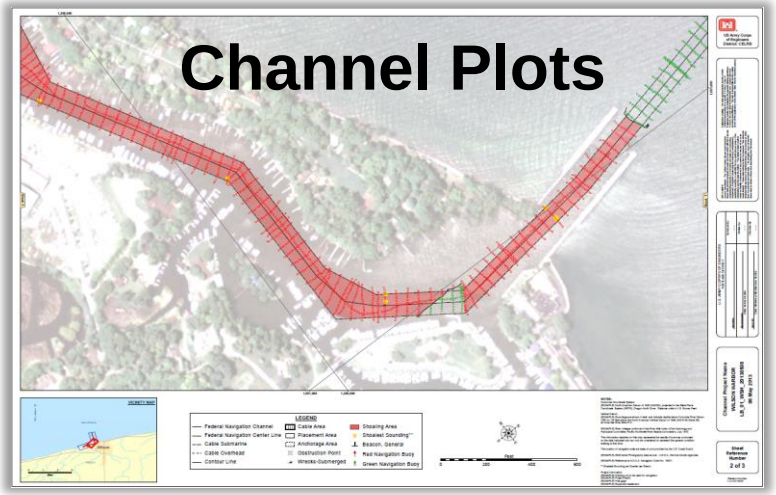
Surveys
XYZ Points, Contour Lines, Shoaling Polys

Framework
Channel Geometry & Stationing

eHydro

Metadata

Channel Plots



Channel Availability Reports

MINIMUM DEPTHS IN EACH 1/4 WIDTH OF CHANNEL ENTERING FROM SEAWARD		
LEFT OUTSIDE QUARTER (feet)	MIDDLE HALF (feet)	RIGHT OUTSIDE QUARTER (feet)
35	40	40
38	42	34
36	38	39
38	37	38
35	38	30

Channel Condition Reports

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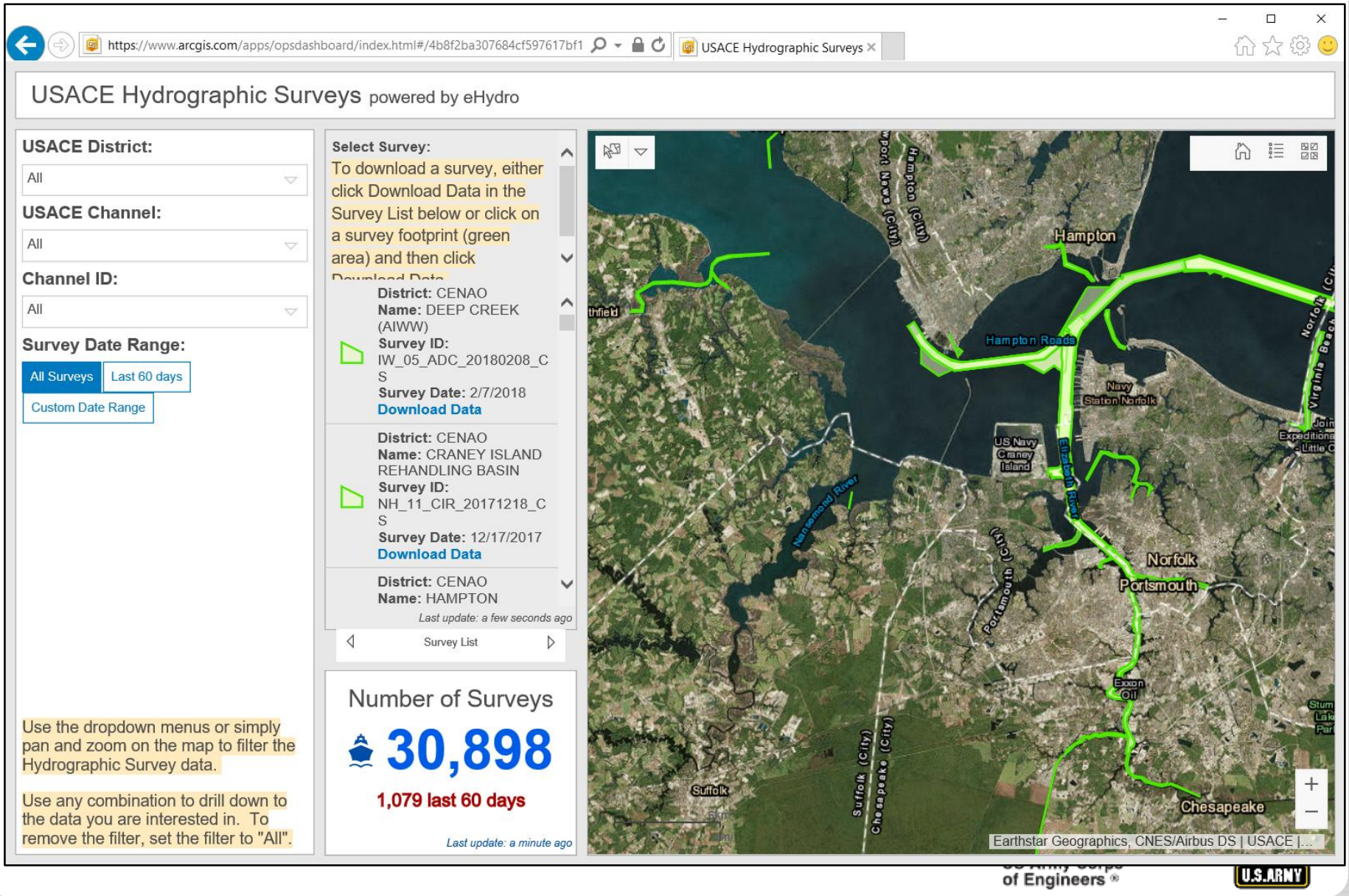
eHydro Portal



Inland eHydro Channel Analysis

- AIS-generated sailing line plotted between shorelines
- critical navigation depth contour plotted from the survey
- Lines perpendicular to the sailing line, known as “fishbones”, are plotted

- fishbones trimmed to 9’ contour, and only longest continuous pieces of fishbones that intersect the sailing line are retained.
- shortest line, highlighted in this example – 487’, represents the most constrained section of channel.

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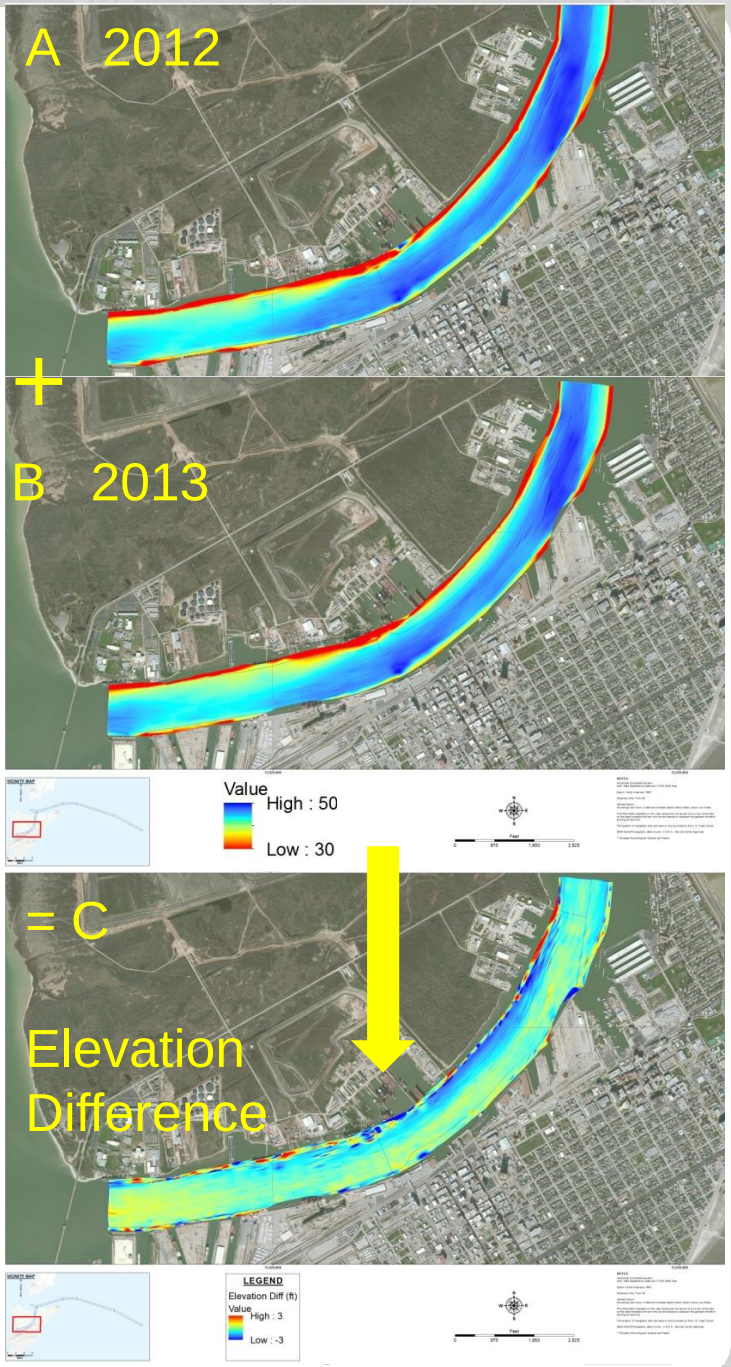
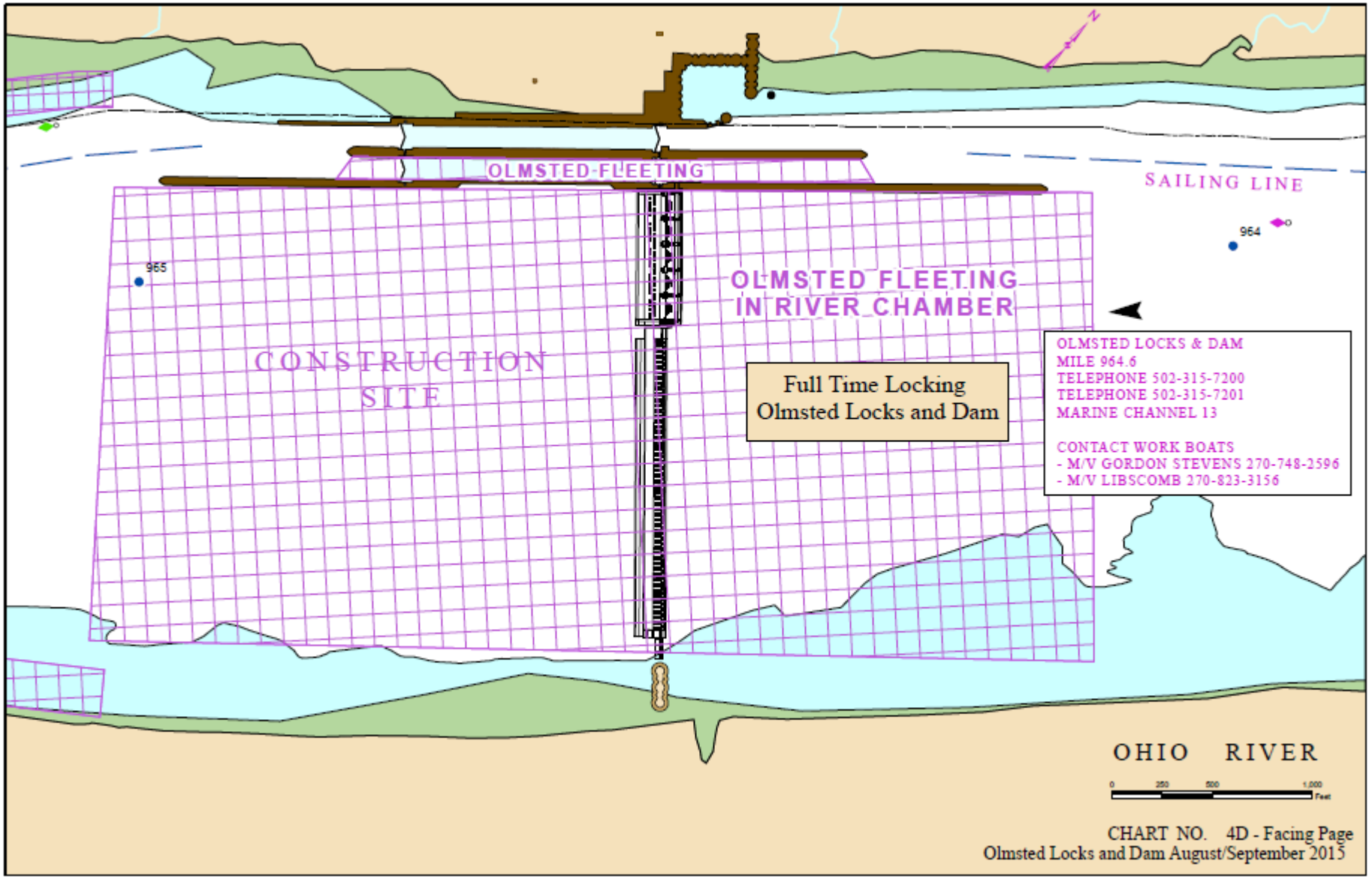
CORPS SHOALING ANALYSIS TOOL

- **Use historical survey data from eHydro and generate difference grid sets between dredging events**
- **Predict average shoaling rates and dredging requirements per channel reach**
- **Report volumes at different depth/time intervals and shoaling rates**
- ***Efficiently process large spatial datasets***

➢ **Outputs to users: map, shoaling rate table**

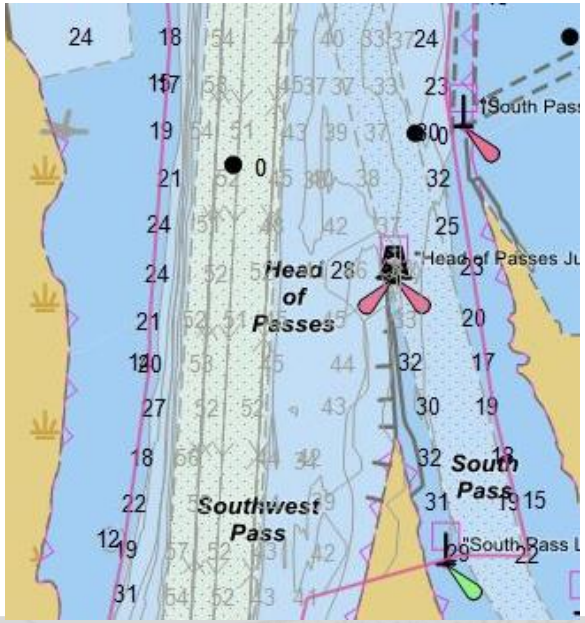


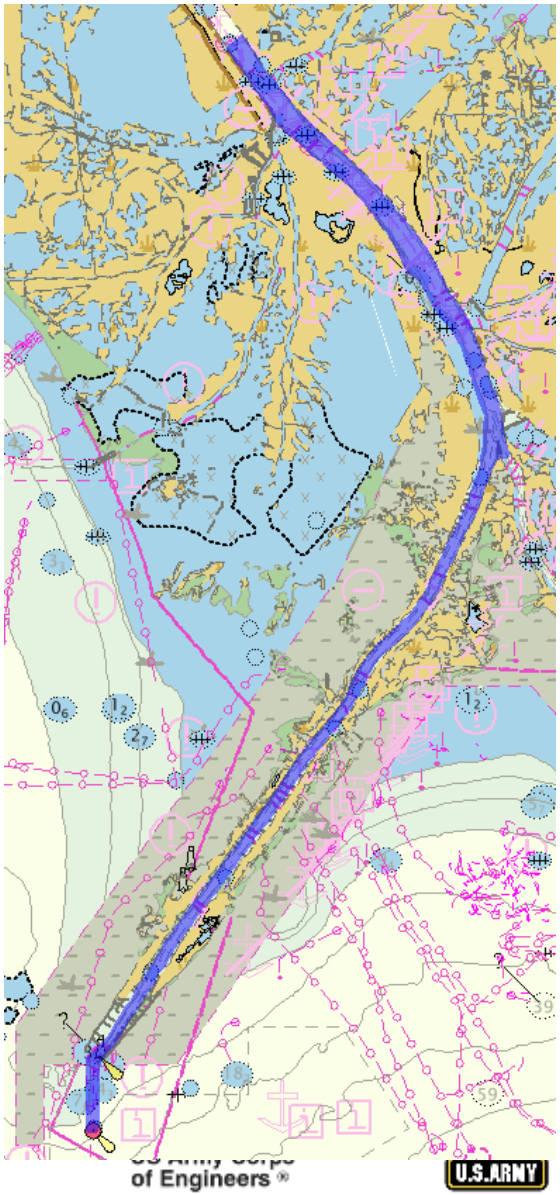
RIVER CONSTRUCTION NOTICE TO INDUSTRY



IENC OVERLAY: MISSISSIPPI RIVER (SOUTHWEST PASS)

- USACE survey data for SW Pass → updated weekly
- Overlay file, 3UASW000 overlays on NOAA ENCs (US4LA30M & US4LA33M)
- USACE Survey data for 3 other areas on the Lower MS River → updated monthly or as needed

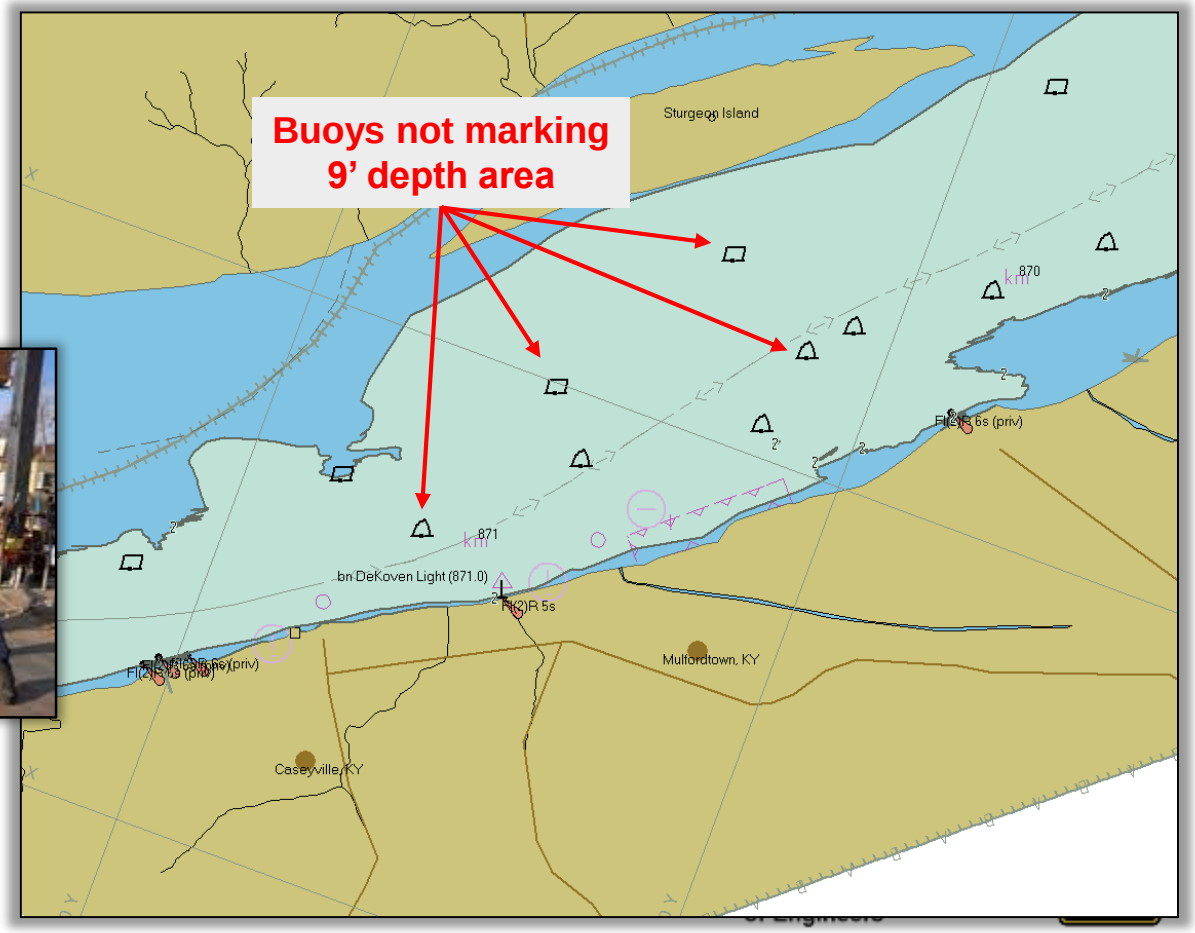




Federal Agency Need:

Buoy Placement On Inland Waterways

- **USCG river tenders need latest conditions to place buoys**
- **Chart overlay needed to guide operators**



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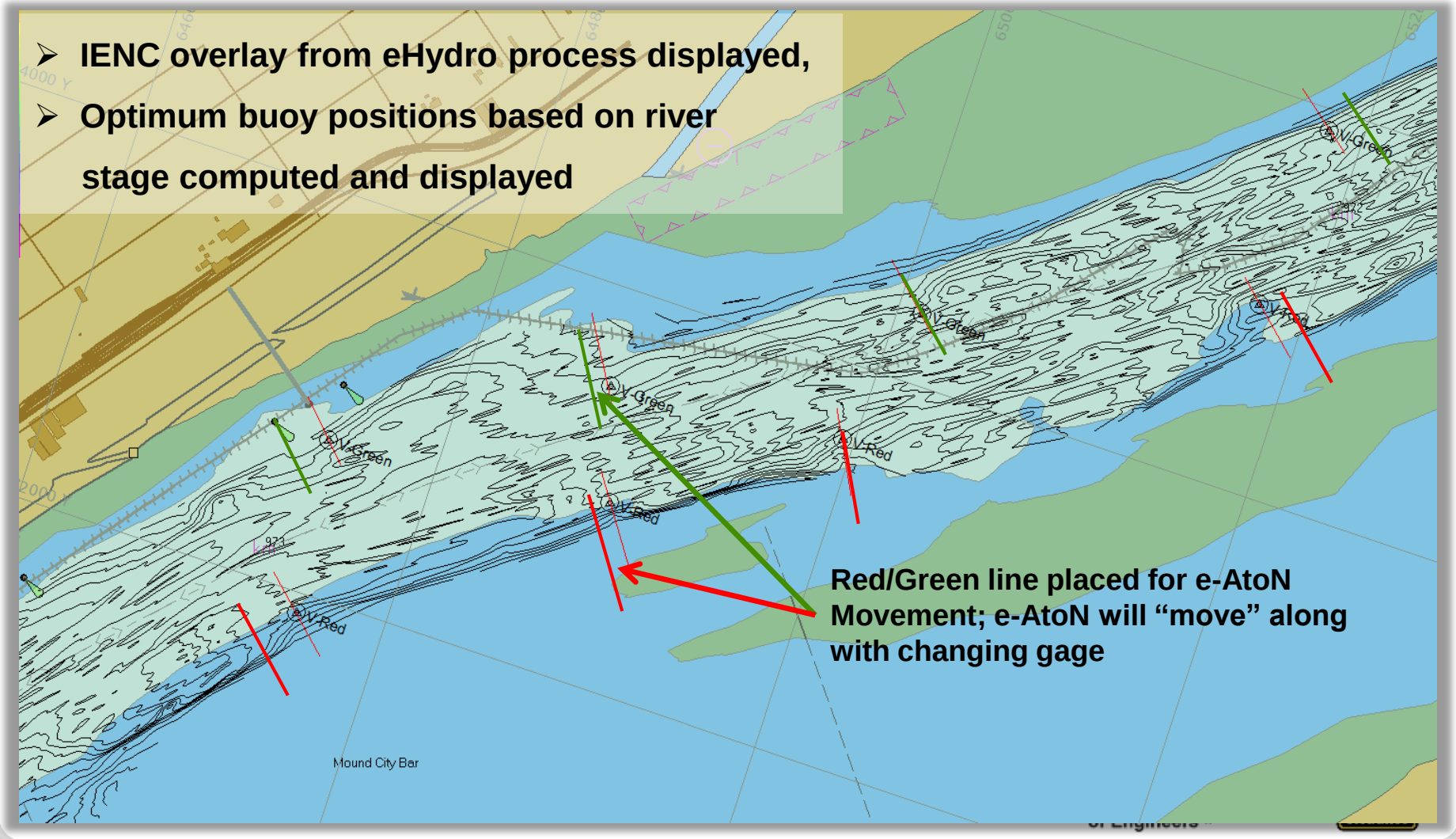
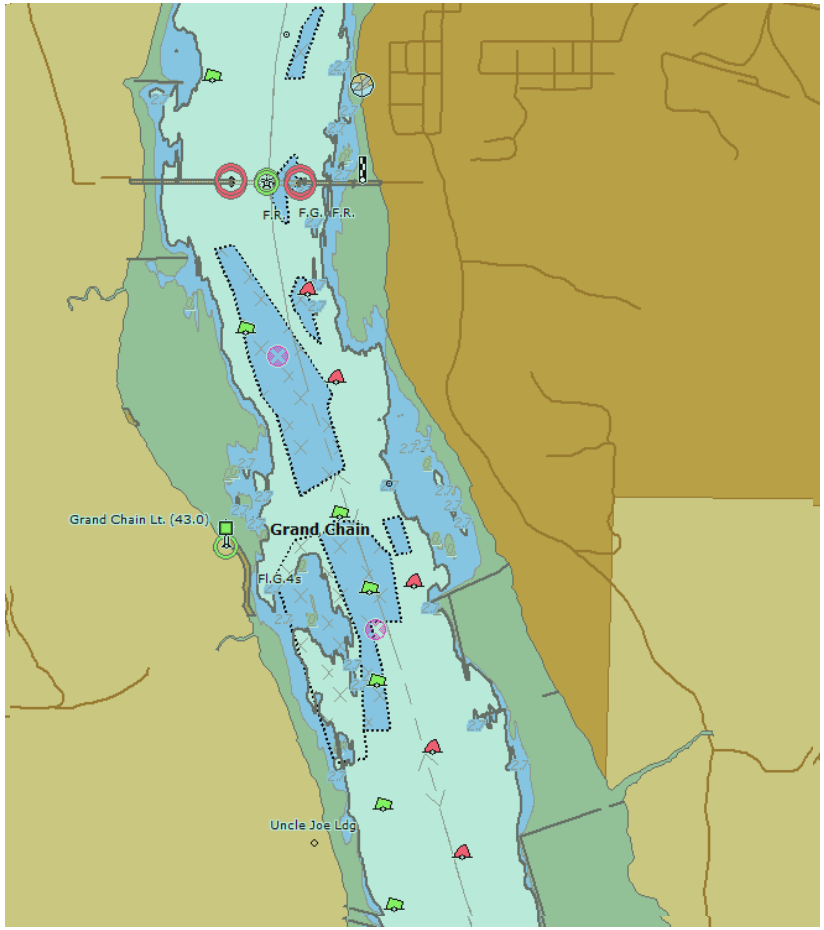
Sample Inland Survey Overlay from eHydro

***IENC displayed in electronic chart system on Coast Guard river tender*;**



IENC OVERLAYS: USCG BUOY PLACEMENT DURING LOW WATER EVENT 2012

- USACE Survey data → USCG for rock pinnacle area on Upper Miss River near Grand Chain
- USCG Cutters used surveys to place buoys
- USCG → Excel file with Buoy Locations
- USACE created Buoy Overlay for USCG & Towing



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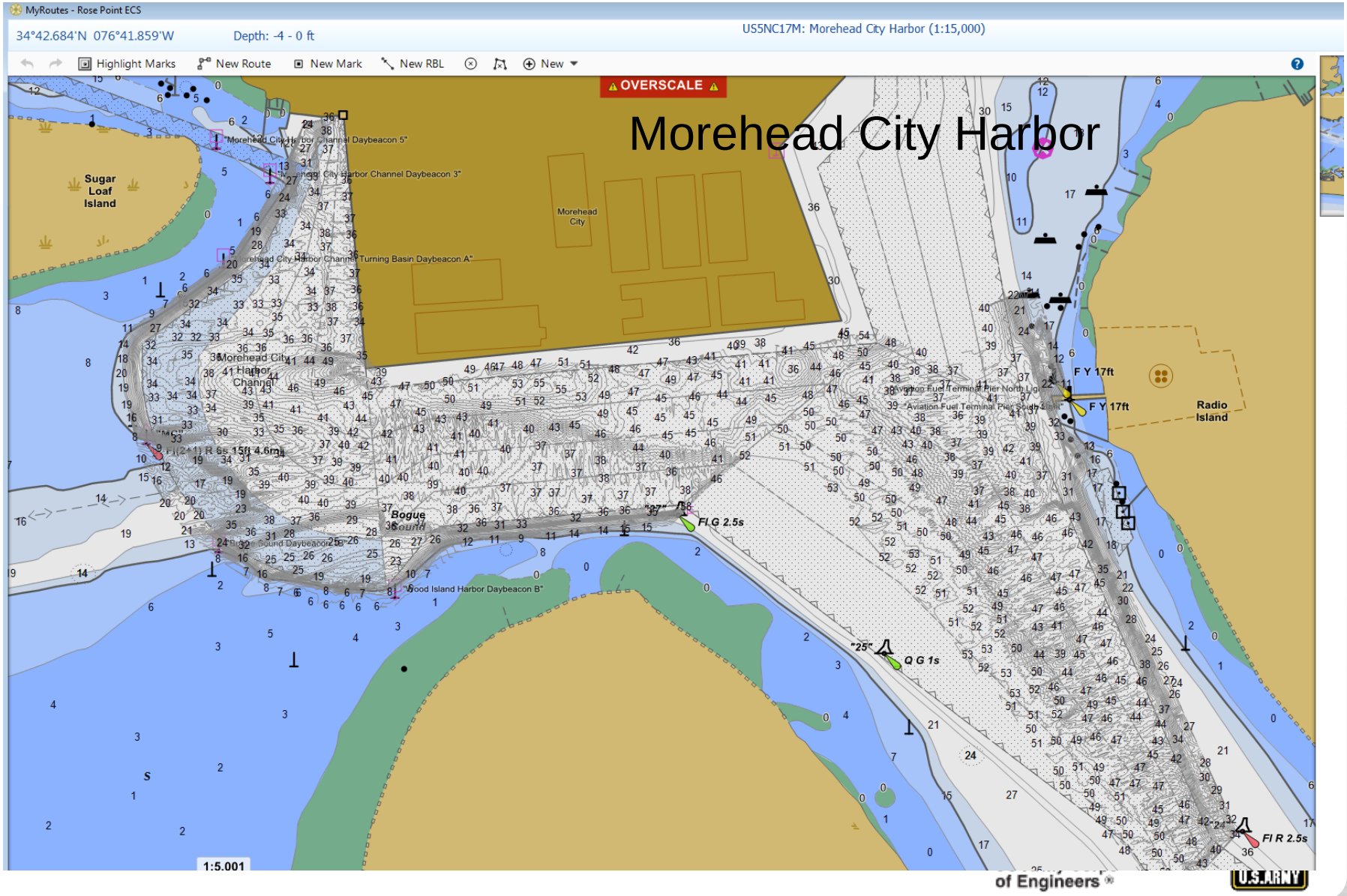
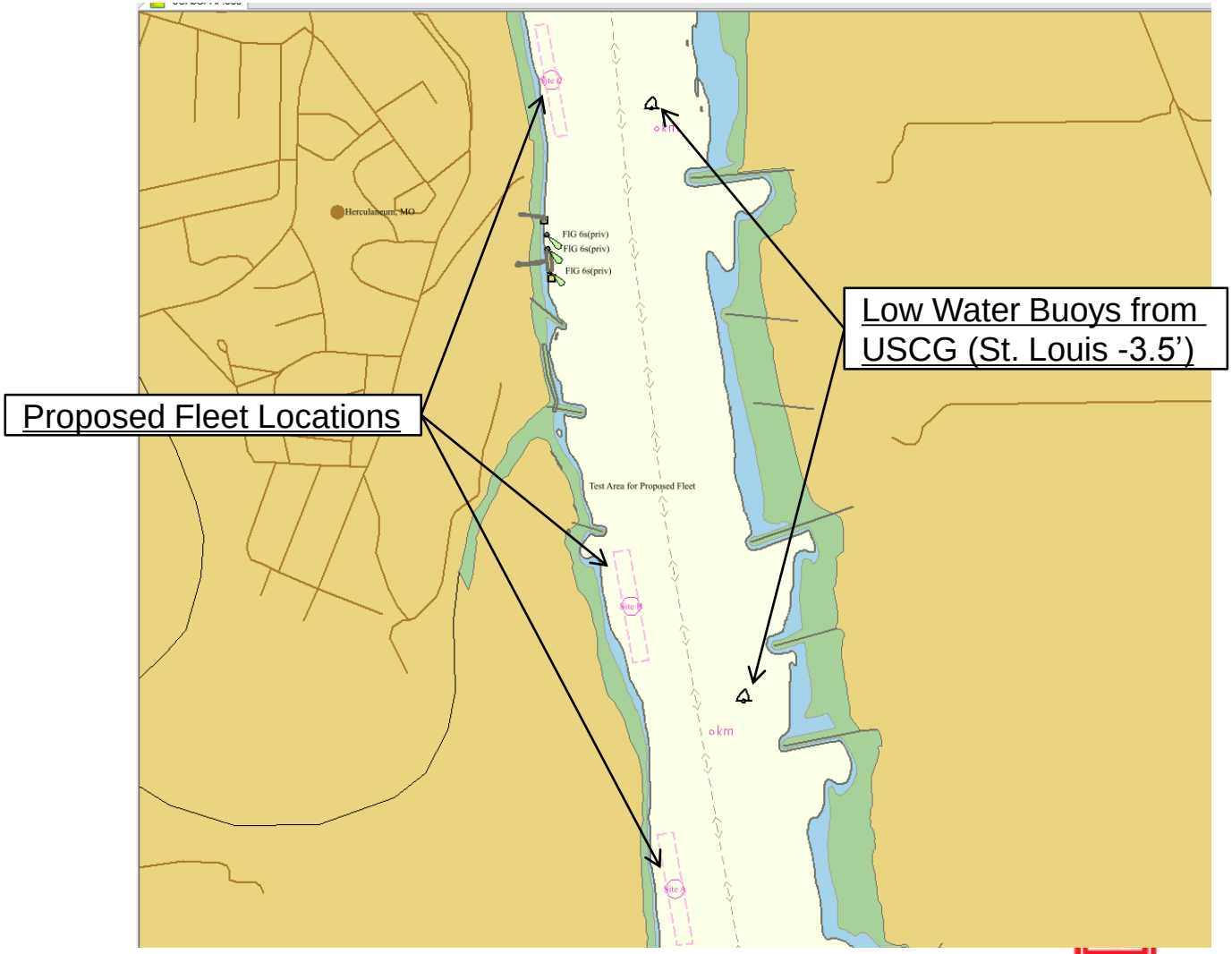
Sample Coastal Survey Overlay from eHydro



IENC Overlays: Chart U37UM079 with Proposed Fleet & Low Water Buoy Overlay (3UAJCPAF)



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